



Full wwPDB X-ray Structure Validation Report ⓘ

Jul 17, 2024 – 01:40 pm BST

PDB ID : 8OQV
Title : Structure of Mycobacterium tuberculosis beta-oxidation trifunctional enzyme in complex with Fragment-M-109
Authors : Dalwani, S.; Wierenga, R.K.; Venkatesan, R.
Deposited on : 2023-04-12
Resolution : 2.78 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.37.1
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.37.1

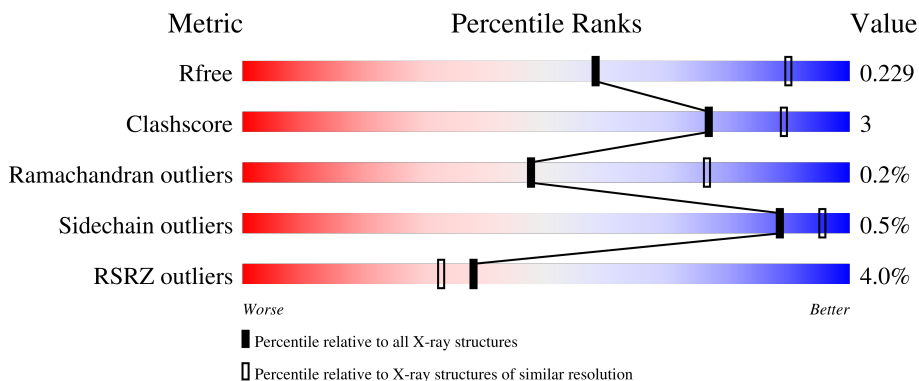
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.78 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	4107 (2.80-2.76)
Clashscore	141614	4575 (2.80-2.76)
Ramachandran outliers	138981	4487 (2.80-2.76)
Sidechain outliers	138945	4489 (2.80-2.76)
RSRZ outliers	127900	4027 (2.80-2.76)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	736	 6% 92% 7% .
1	B	736	 2% 93% 5% .
2	C	403	 3% 85% 12% .
2	D	403	 4% 85% 13% .

2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 16903 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called 3-hydroxyacyl-CoA dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	727	Total	C	N	O	S	0	0	0
			5414	3425	932	1036	21			
1	B	726	Total	C	N	O	S	0	0	0
			5409	3423	931	1034	21			

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-15	MET	-	initiating methionine	UNP O53872
A	-14	GLY	-	expression tag	UNP O53872
A	-13	SER	-	expression tag	UNP O53872
A	-12	SER	-	expression tag	UNP O53872
A	-11	HIS	-	expression tag	UNP O53872
A	-10	HIS	-	expression tag	UNP O53872
A	-9	HIS	-	expression tag	UNP O53872
A	-8	HIS	-	expression tag	UNP O53872
A	-7	HIS	-	expression tag	UNP O53872
A	-6	HIS	-	expression tag	UNP O53872
A	-5	SER	-	expression tag	UNP O53872
A	-4	GLN	-	expression tag	UNP O53872
A	-3	ASP	-	expression tag	UNP O53872
A	-2	PRO	-	expression tag	UNP O53872
A	-1	ASN	-	expression tag	UNP O53872
A	0	SER	-	expression tag	UNP O53872
B	-15	MET	-	initiating methionine	UNP O53872
B	-14	GLY	-	expression tag	UNP O53872
B	-13	SER	-	expression tag	UNP O53872
B	-12	SER	-	expression tag	UNP O53872
B	-11	HIS	-	expression tag	UNP O53872
B	-10	HIS	-	expression tag	UNP O53872
B	-9	HIS	-	expression tag	UNP O53872
B	-8	HIS	-	expression tag	UNP O53872
B	-7	HIS	-	expression tag	UNP O53872

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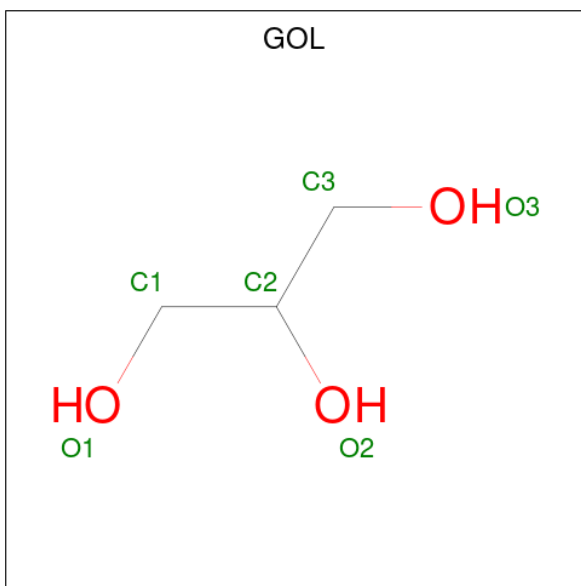
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Chain	Residue	Modelled	Actual	Comment	Reference
B	-6	HIS	-	expression tag	UNP O53872
B	-5	SER	-	expression tag	UNP O53872
B	-4	GLN	-	expression tag	UNP O53872
B	-3	ASP	-	expression tag	UNP O53872
B	-2	PRO	-	expression tag	UNP O53872
B	-1	ASN	-	expression tag	UNP O53872
B	0	SER	-	expression tag	UNP O53872

- Molecule 2 is a protein called Putative acyltransferase Rv0859.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	395	Total 2916	C 1819	N 518	O 564	S 15	0	0	0
2	D	397	Total 2929	C 1827	N 520	O 566	S 16	0	0	0

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
3	A	1	Total 6	C 3	O 3	0	0
3	B	1	Total 6	C 3	O 3	0	0

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



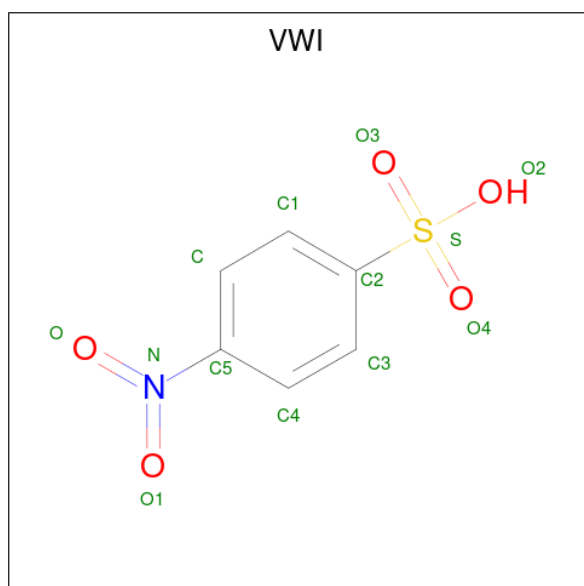
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total O S 5 4 1	0	0
4	A	1	Total O S 5 4 1	0	0
4	A	1	Total O S 5 4 1	0	0
4	A	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	C	1	Total O S 5 4 1	0	0
4	C	1	Total O S 5 4 1	0	0
4	C	1	Total O S 5 4 1	0	0
4	C	1	Total O S 5 4 1	0	0
4	C	1	Total O S 5 4 1	0	0
4	C	1	Total O S 5 4 1	0	0
4	D	1	Total O S 5 4 1	0	0
4	D	1	Total O S 5 4 1	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	D	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		

- Molecule 5 is 4-nitrobenzenesulfonic acid (three-letter code: VWI) (formula: $C_6H_5NO_5S$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
5	A	1	Total	C	N	O	S	0	0
			13	6	1	5	1		
5	A	1	Total	C	N	O	S	0	0
			13	6	1	5	1		
5	A	1	Total	C	N	O	S	0	0
			13	6	1	5	1		
5	A	1	Total	C	N	O	S	0	0
			13	6	1	5	1		
5	B	1	Total	C	N	O	S	0	0
			13	6	1	5	1		
5	B	1	Total	C	N	O	S	0	0
			13	6	1	5	1		
5	B	1	Total	C	N	O	S	0	0
			13	6	1	5	1		

- Molecule 6 is water.

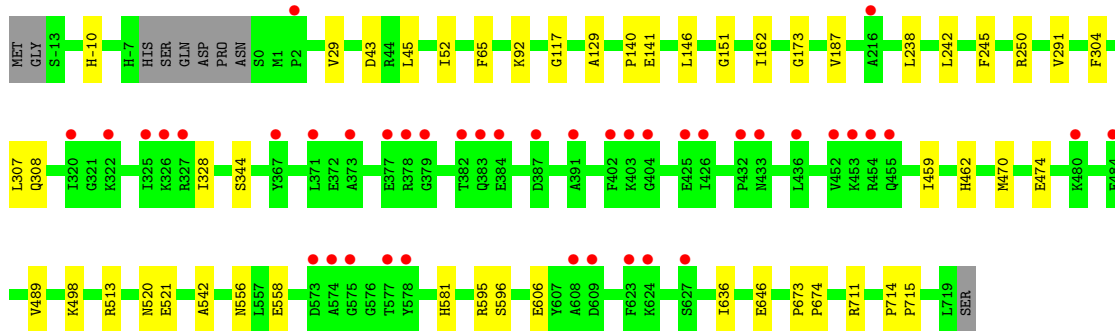
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	13	Total O 13 13	0	0
6	B	15	Total O 15 15	0	0
6	C	12	Total O 12 12	0	0
6	D	7	Total O 7 7	0	0

3 Residue-property plots [i](#)

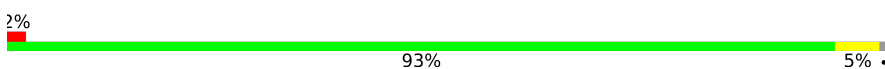
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

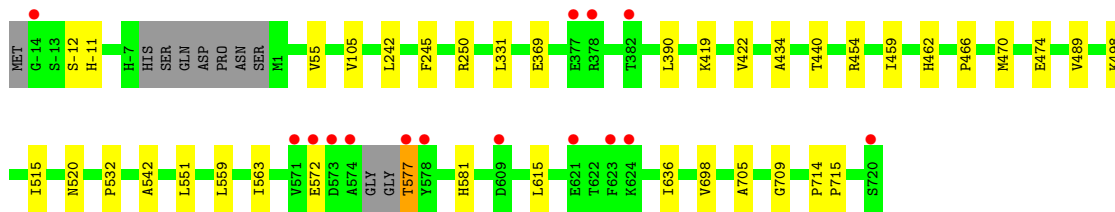
- Molecule 1: 3-hydroxyacyl-CoA dehydrogenase

Chain A: 




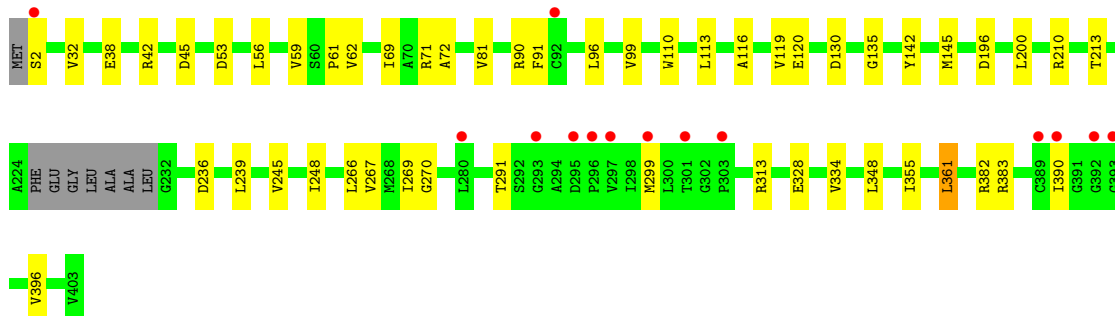
- Molecule 1: 3-hydroxyacyl-CoA dehydrogenase

Chain B: 

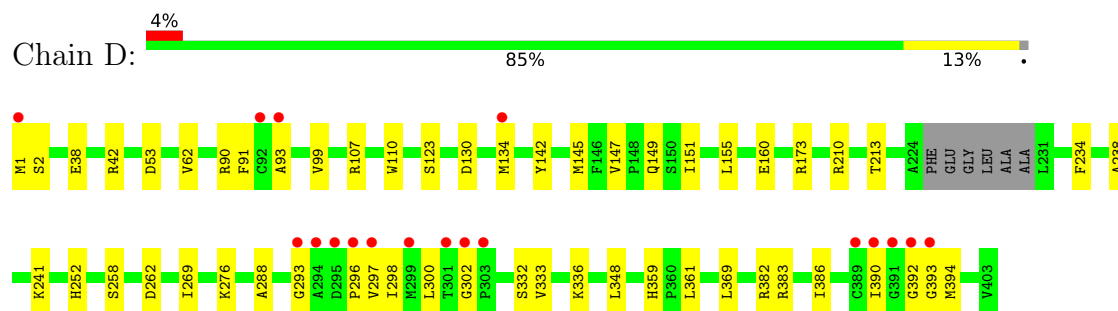


- Molecule 2: Putative acyltransferase Rv0859

Chain C: 



- Molecule 2: Putative acyltransferase Rv0859



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	248.79Å 135.63Å 119.70Å 90.00° 110.63° 90.00°	Depositor
Resolution (Å)	45.51 – 2.78 45.51 – 2.78	Depositor EDS
% Data completeness (in resolution range)	85.9 (45.51-2.78) 86.0 (45.51-2.78)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.20 (at 2.77Å)	Xtrriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.197 , 0.232 0.196 , 0.229	Depositor DCC
R_{free} test set	3999 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å ²)	70.5	Xtrriage
Anisotropy	0.010	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 38.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	16903	wwPDB-VP
Average B, all atoms (Å ²)	72.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.62% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: VWI, SO4, GOL

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.25	0/5516	0.45	0/7464
1	B	0.25	0/5510	0.46	0/7455
2	C	0.24	0/2959	0.50	0/4005
2	D	0.24	0/2972	0.50	0/4022
All	All	0.24	0/16957	0.47	0/22946

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	5414	0	5455	23	0
1	B	5409	0	5451	22	0
2	C	2916	0	2935	33	0
2	D	2929	0	2949	37	0
3	A	6	0	8	0	0
3	B	6	0	8	0	0
4	A	20	0	0	0	0
4	B	10	0	0	0	0
4	C	30	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	D	25	0	0	0	0
5	A	52	0	0	0	0
5	B	39	0	0	0	0
6	A	13	0	0	0	0
6	B	15	0	0	0	0
6	C	12	0	0	0	0
6	D	7	0	0	0	0
All	All	16903	0	16806	102	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.

All (102) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:250:ARG:NH1	2:D:142:TYR:O	2.20	0.75
1:B:250:ARG:NH1	2:C:142:TYR:O	2.23	0.72
2:D:390:ILE:HB	2:D:394:MET:HB2	1.74	0.70
1:B:520:ASN:HB3	1:B:581:HIS:CE1	2.35	0.61
2:D:62:VAL:HG21	2:D:130:ASP:HA	1.82	0.60
2:D:382:ARG:HG3	2:D:383:ARG:HG3	1.83	0.59
2:D:151:ILE:HD13	2:D:234:PHE:HB2	1.85	0.59
1:A:462:HIS:HB3	1:A:474:GLU:HB3	1.84	0.59
2:C:90:ARG:NH2	2:D:53:ASP:OD2	2.34	0.58
2:C:96:LEU:HD23	2:C:396:VAL:HG13	1.84	0.58
2:C:291:THR:HG22	2:C:396:VAL:HG23	1.85	0.57
2:C:62:VAL:HG12	2:D:62:VAL:HG22	1.87	0.57
1:B:462:HIS:HB3	1:B:474:GLU:HB3	1.87	0.57
2:D:369:LEU:HD12	2:D:386:ILE:HD13	1.86	0.57
1:A:146:LEU:HD22	1:A:291:VAL:HG22	1.88	0.55
2:C:62:VAL:HG11	2:C:130:ASP:HA	1.88	0.55
2:C:81:VAL:HG11	2:D:296:PRO:HD3	1.88	0.55
2:D:300:LEU:HD13	2:D:333:VAL:HG21	1.89	0.55
1:B:470:MET:O	1:B:498:LYS:NZ	2.35	0.54
2:C:72:ALA:HA	2:D:134:MET:HE3	1.90	0.54
2:D:293:GLY:HA2	2:D:302:GLY:HA2	1.89	0.54
2:D:99:VAL:HG13	2:D:269:ILE:HD11	1.88	0.53
1:A:-10:HIS:NE2	1:A:43:ASP:OD2	2.40	0.52
1:A:304:PHE:O	1:A:308:GLN:HG2	2.09	0.52
2:C:313:ARG:HD3	2:D:110:TRP:CD1	2.45	0.52
2:C:382:ARG:HG3	2:C:383:ARG:HG3	1.92	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:434:ALA:O	1:B:454:ARG:NH2	2.39	0.51
1:A:129:ALA:HB2	1:A:187:VAL:HG21	1.92	0.51
2:C:210:ARG:O	2:C:213:THR:OG1	2.24	0.50
1:B:698:VAL:HG13	1:B:714:PRO:HG3	1.93	0.50
1:B:55:VAL:HB	1:B:105:VAL:HG22	1.94	0.50
2:C:71:ARG:NH2	2:D:392:GLY:O	2.44	0.50
1:A:459:ILE:HG21	1:A:489:VAL:HG21	1.93	0.50
1:A:520:ASN:HB3	1:A:581:HIS:CE1	2.48	0.49
2:C:53:ASP:OD2	2:D:90:ARG:NH2	2.44	0.49
2:C:99:VAL:HG13	2:C:269:ILE:HD11	1.95	0.48
2:C:91:PHE:HB2	2:C:390:ILE:HG23	1.96	0.48
1:B:250:ARG:NH1	2:C:145:MET:HG2	2.29	0.48
1:B:331:LEU:HD13	1:B:422:VAL:HG12	1.95	0.48
2:D:160:GLU:HG3	2:D:336:LYS:HG3	1.95	0.47
2:D:241:LYS:HD3	2:D:297:VAL:HG21	1.96	0.47
2:D:173:ARG:NH2	2:D:348:LEU:O	2.45	0.47
2:D:91:PHE:HB2	2:D:390:ILE:HG23	1.96	0.47
1:A:558:GLU:HG2	1:A:596:SER:HB2	1.96	0.47
2:C:266:LEU:HD23	2:C:266:LEU:HA	1.81	0.47
2:C:2:SER:N	2:D:2:SER:HG	2.13	0.47
2:C:59:VAL:O	2:C:61:PRO:HD3	2.16	0.46
2:D:93:ALA:HB3	2:D:390:ILE:HD11	1.96	0.46
2:D:149:GLN:HG3	2:D:300:LEU:HD21	1.98	0.46
2:C:239:LEU:HD21	2:C:248:ILE:HG13	1.98	0.45
2:D:293:GLY:HA3	2:D:393:GLY:O	2.16	0.45
1:B:459:ILE:HG21	1:B:489:VAL:HG21	1.98	0.45
2:C:116:ALA:O	2:C:267:VAL:N	2.46	0.45
1:A:470:MET:O	1:A:498:LYS:NZ	2.45	0.45
1:B:-12:SER:OG	1:B:-11:HIS:N	2.50	0.45
2:C:38:GLU:HG3	2:C:42:ARG:HD2	1.97	0.45
2:C:334:VAL:HG12	2:C:348:LEU:HD21	1.98	0.45
2:C:239:LEU:HD22	2:C:245:VAL:HG13	1.99	0.44
1:B:532:PRO:HB2	1:B:615:LEU:HD13	2.00	0.44
2:C:59:VAL:HG21	2:C:361:LEU:HB3	2.00	0.44
2:D:258:SER:HB2	2:D:359:HIS:HB2	2.00	0.44
1:B:572:GLU:OE2	1:B:577:THR:HA	2.18	0.44
2:D:147:VAL:HG21	2:D:238:ALA:HB2	1.98	0.44
2:C:32:VAL:HG11	2:C:56:LEU:HD11	2.00	0.43
2:C:196:ASP:OD1	2:C:200:LEU:N	2.50	0.43
1:A:242:LEU:HD12	1:A:245:PHE:CD2	2.54	0.43
2:C:120:GLU:HG2	2:C:361:LEU:HB2	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:210:ARG:O	2:D:213:THR:OG1	2.27	0.43
1:A:92:LYS:HD3	1:A:151:GLY:N	2.33	0.43
1:A:542:ALA:HB2	1:A:636:ILE:HG23	2.01	0.43
2:D:38:GLU:HG3	2:D:42:ARG:HD2	2.00	0.43
1:A:673:PRO:HA	1:A:674:PRO:HD3	1.93	0.42
1:B:419:LYS:HE2	1:B:440:THR:HB	2.00	0.42
2:C:328:GLU:HB3	2:C:355:ILE:HG13	2.02	0.42
2:D:91:PHE:HB2	2:D:390:ILE:CG2	2.48	0.42
1:B:705:ALA:HA	1:B:709:GLY:O	2.20	0.42
1:B:714:PRO:HA	1:B:715:PRO:HD3	1.95	0.42
2:D:149:GLN:HG2	2:D:300:LEU:HD11	2.01	0.42
1:A:521:GLU:OE2	1:A:711:ARG:NE	2.38	0.42
1:B:459:ILE:HD13	1:B:489:VAL:HG21	2.02	0.42
1:B:559:LEU:O	1:B:563:ILE:HG13	2.20	0.41
2:D:155:LEU:HD23	2:D:298:ILE:HG13	2.02	0.41
1:A:45:LEU:HD23	1:A:52:ILE:HD13	2.02	0.41
1:B:369:GLU:HG2	1:B:390:LEU:HD13	2.02	0.41
2:D:252:HIS:HE1	2:D:332:SER:H	1.68	0.41
1:A:162:ILE:HD12	1:A:238:LEU:HD21	2.03	0.41
1:A:595:ARG:HH22	1:A:606:GLU:HG2	1.85	0.41
1:A:513:ARG:NE	1:A:646:GLU:OE2	2.42	0.41
2:C:113:LEU:HD12	2:C:270:GLY:HA3	2.02	0.41
2:D:123:SER:OG	2:D:262:ASP:OD2	2.29	0.41
1:A:328:ILE:HD12	1:A:344:SER:HB3	2.02	0.41
1:A:140:PRO:HA	1:A:173:GLY:HA3	2.02	0.41
1:B:242:LEU:HD12	1:B:245:PHE:CD2	2.56	0.41
1:B:515:ILE:HD11	1:B:551:LEU:HD21	2.03	0.41
1:B:542:ALA:HB2	1:B:636:ILE:HG23	2.03	0.41
2:C:110:TRP:CZ2	2:D:288:ALA:HA	2.56	0.41
2:D:145:MET:O	2:D:297:VAL:HG22	2.21	0.40
1:A:65:PHE:HB3	1:A:117:GLY:CA	2.51	0.40
2:C:2:SER:N	2:D:2:SER:OG	2.54	0.40
2:D:1:MET:HA	2:D:107:ARG:NH2	2.37	0.40
1:A:714:PRO:HA	1:A:715:PRO:HD3	1.97	0.40
2:C:69:ILE:HD13	2:C:119:VAL:HG11	2.04	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	723/736 (98%)	689 (95%)	33 (5%)	1 (0%)	51	80
1	B	720/736 (98%)	693 (96%)	27 (4%)	0	100	100
2	C	391/403 (97%)	375 (96%)	13 (3%)	3 (1%)	19	47
2	D	393/403 (98%)	376 (96%)	16 (4%)	1 (0%)	41	70
All	All	2227/2278 (98%)	2133 (96%)	89 (4%)	5 (0%)	47	76

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	C	361	LEU
2	D	361	LEU
2	C	135	GLY
1	A	556	ASN
2	C	299	MET

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	558/566 (99%)	555 (100%)	3 (0%)	88	95
1	B	558/566 (99%)	556 (100%)	2 (0%)	91	96
2	C	305/310 (98%)	303 (99%)	2 (1%)	84	94
2	D	306/310 (99%)	305 (100%)	1 (0%)	92	97
All	All	1727/1752 (99%)	1719 (100%)	8 (0%)	88	95

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	29	VAL
1	A	141	GLU
1	A	307	LEU
1	B	466	PRO
1	B	577	THR
2	C	45	ASP
2	C	236	ASP
2	D	276	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	D	149	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

26 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	SO4	C	501	-	4,4,4	0.13	0	6,6,6	0.07	0
4	SO4	D	501	-	4,4,4	0.14	0	6,6,6	0.05	0
4	SO4	B	803	-	4,4,4	0.14	0	6,6,6	0.06	0
4	SO4	D	502	-	4,4,4	0.14	0	6,6,6	0.07	0
5	VWI	A	807	-	13,13,13	0.26	0	19,19,19	0.19	0
3	GOL	B	801	-	5,5,5	0.93	0	5,5,5	0.99	0
5	VWI	B	804	-	13,13,13	0.26	0	19,19,19	0.18	0
4	SO4	B	802	-	4,4,4	0.14	0	6,6,6	0.05	0
4	SO4	C	505	-	4,4,4	0.14	0	6,6,6	0.07	0
3	GOL	A	801	-	5,5,5	0.90	0	5,5,5	1.07	0
4	SO4	C	502	-	4,4,4	0.14	0	6,6,6	0.07	0
5	VWI	B	806	-	13,13,13	0.17	0	19,19,19	0.20	0
4	SO4	A	802	-	4,4,4	0.14	0	6,6,6	0.05	0
4	SO4	A	803	-	4,4,4	0.14	0	6,6,6	0.07	0
4	SO4	A	804	-	4,4,4	0.14	0	6,6,6	0.07	0
5	VWI	A	809	-	13,13,13	0.21	0	19,19,19	0.20	0
4	SO4	D	504	-	4,4,4	0.14	0	6,6,6	0.35	0
4	SO4	C	506	-	4,4,4	0.13	0	6,6,6	0.06	0
4	SO4	D	503	-	4,4,4	0.14	0	6,6,6	0.06	0
5	VWI	A	806	-	13,13,13	0.27	0	19,19,19	0.18	0
5	VWI	A	808	-	13,13,13	0.23	0	19,19,19	0.18	0
4	SO4	C	504	-	4,4,4	0.14	0	6,6,6	0.05	0
4	SO4	C	503	-	4,4,4	0.14	0	6,6,6	0.05	0
5	VWI	B	805	-	13,13,13	0.28	0	19,19,19	0.19	0
4	SO4	A	805	-	4,4,4	0.14	0	6,6,6	0.05	0
4	SO4	D	505	-	4,4,4	0.16	0	6,6,6	0.06	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	VWI	A	809	-	-	0/10/10/10	0/1/1/1
5	VWI	A	806	-	-	0/10/10/10	0/1/1/1
3	GOL	A	801	-	-	0/4/4/4	-
5	VWI	A	807	-	-	0/10/10/10	0/1/1/1
5	VWI	A	808	-	-	0/10/10/10	0/1/1/1
5	VWI	B	806	-	-	0/10/10/10	0/1/1/1
3	GOL	B	801	-	-	2/4/4/4	-
5	VWI	B	804	-	-	0/10/10/10	0/1/1/1
5	VWI	B	805	-	-	0/10/10/10	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

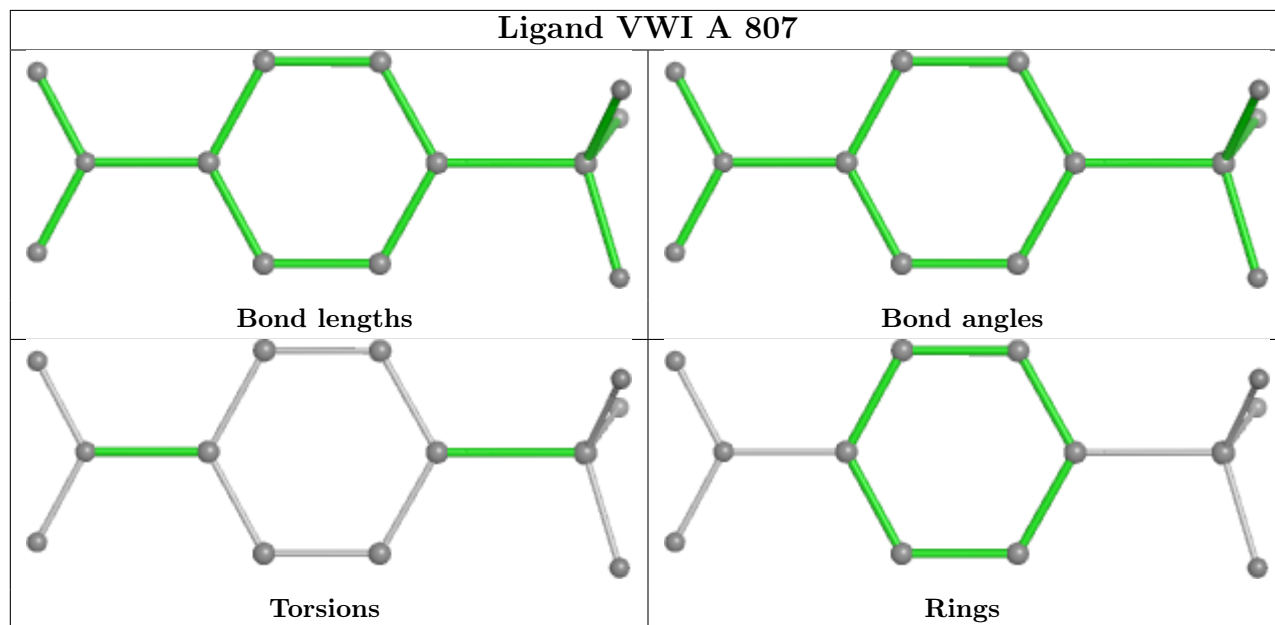
All (2) torsion outliers are listed below:

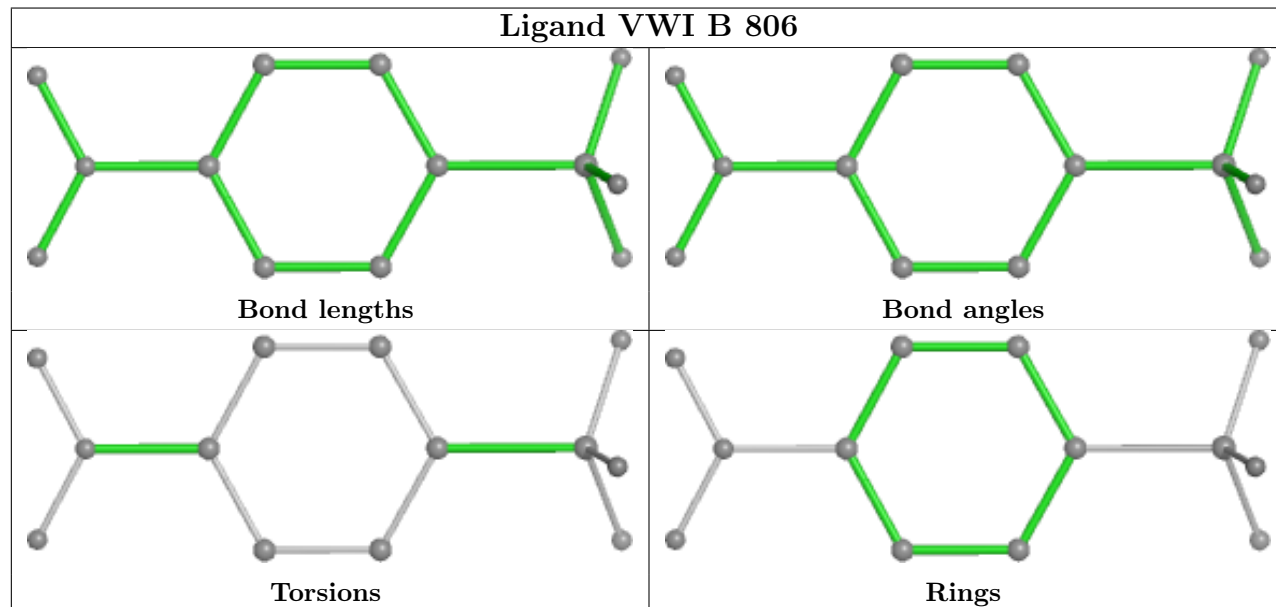
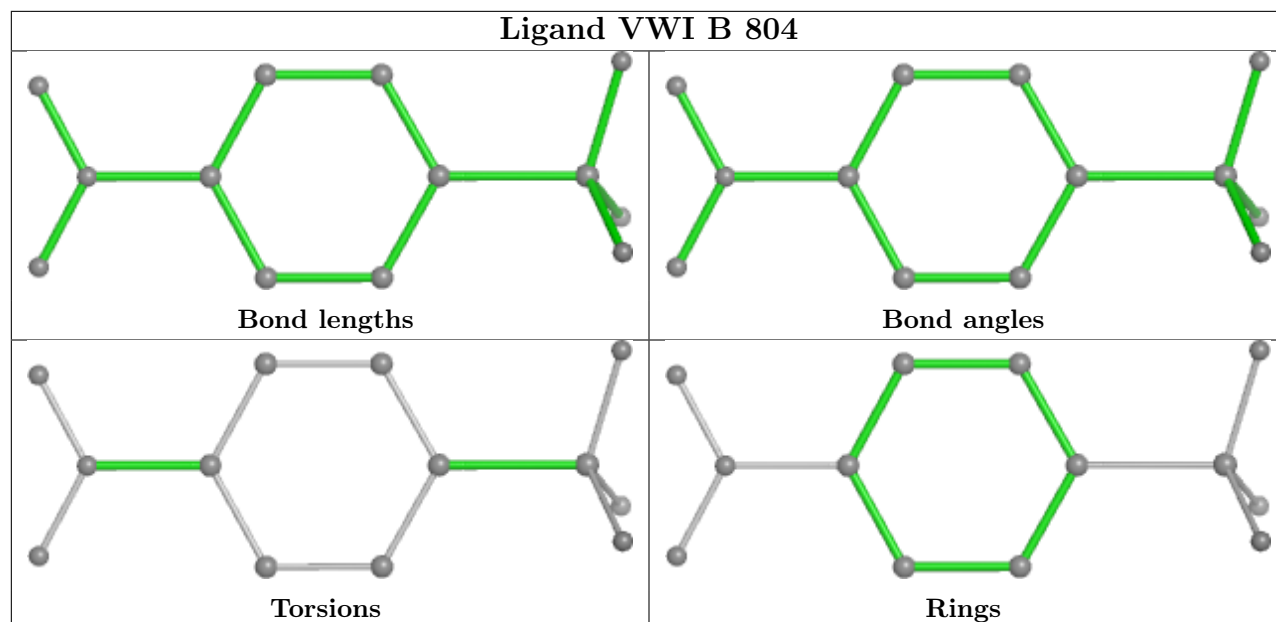
Mol	Chain	Res	Type	Atoms
3	B	801	GOL	O1-C1-C2-O2
3	B	801	GOL	O1-C1-C2-C3

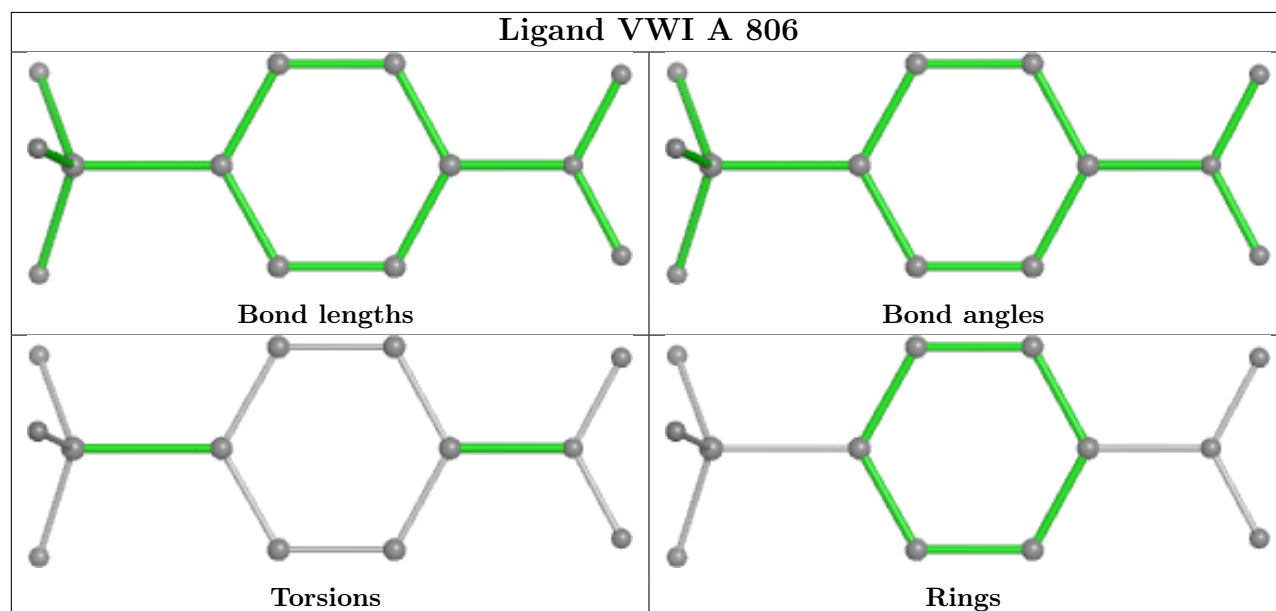
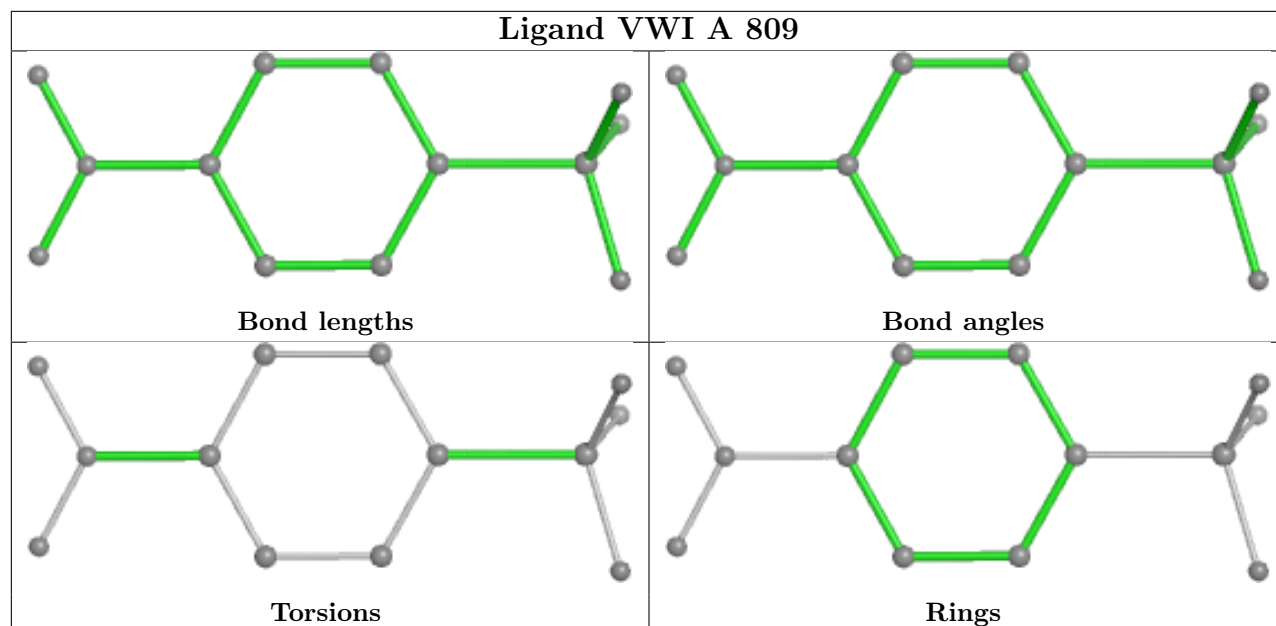
There are no ring outliers.

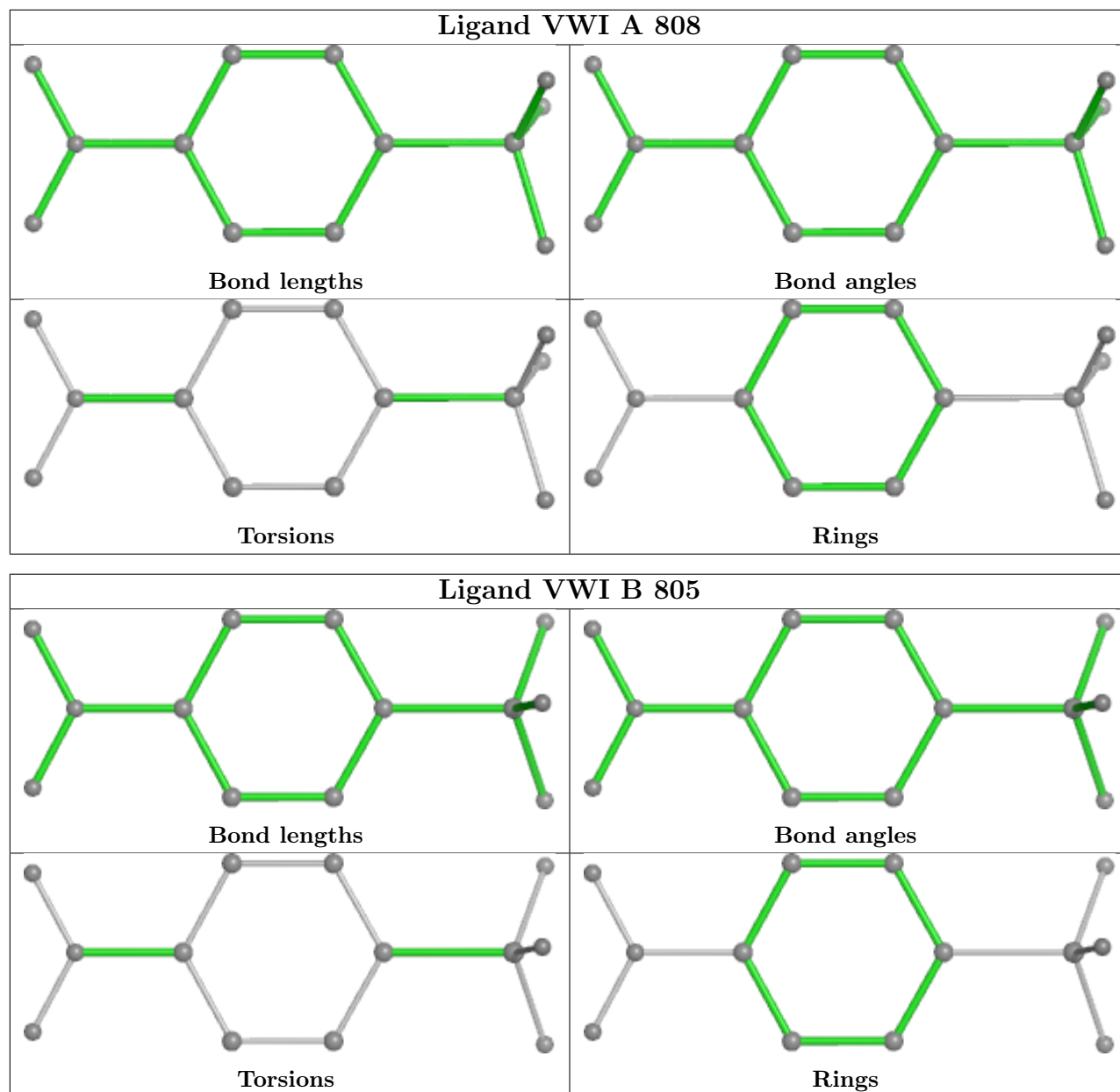
No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.









5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	727/736 (98%)	0.21	42 (5%) 23 18	42, 73, 126, 165	0
1	B	726/736 (98%)	-0.02	15 (2%) 63 59	39, 65, 107, 183	0
2	C	395/403 (98%)	0.16	14 (3%) 44 38	41, 57, 93, 156	0
2	D	397/403 (98%)	0.25	18 (4%) 33 27	42, 63, 103, 205	0
All	All	2245/2278 (98%)	0.13	89 (3%) 38 33	39, 66, 117, 205	0

All (89) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	294	ALA	7.4
2	D	301	THR	6.7
2	D	296	PRO	5.9
1	B	573	ASP	5.1
2	C	390	ILE	4.9
1	A	320	ILE	4.8
1	A	387	ASP	4.7
1	A	575	GLY	4.7
1	B	577	THR	4.6
2	D	392	GLY	4.4
1	A	382	THR	4.2
1	B	572	GLU	4.1
2	D	1	MET	4.0
1	B	578	TYR	3.8
1	A	378	ARG	3.7
1	A	454	ARG	3.7
2	D	390	ILE	3.6
1	A	452	VAL	3.6
2	D	303	PRO	3.6
2	C	389	CYS	3.6
1	A	433	ASN	3.6

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Mol	Chain	Res	Type	RSRZ
2	D	295	ASP	3.5
1	A	403	LYS	3.5
2	C	392	GLY	3.5
2	D	302	GLY	3.5
1	A	426	ILE	3.5
1	B	377	GLU	3.5
1	A	577	THR	3.4
1	B	571	VAL	3.4
2	D	293	GLY	3.4
1	A	574	ALA	3.4
2	D	389	CYS	3.4
2	D	391	GLY	3.4
2	C	293	GLY	3.2
1	A	608	ALA	3.2
1	B	621	GLU	3.1
2	C	296	PRO	3.1
2	C	2	SER	3.0
1	A	322	LYS	3.0
1	A	578	TYR	3.0
1	A	2	PRO	3.0
1	A	377	GLU	3.0
1	A	432	PRO	2.9
2	D	299	MET	2.9
1	B	574	ALA	2.9
1	A	383	GLN	2.8
2	D	297	VAL	2.8
1	A	327	ARG	2.8
2	C	301	THR	2.8
1	A	609	ASP	2.8
1	A	373	ALA	2.8
1	A	484	GLU	2.8
1	B	609	ASP	2.8
1	B	378	ARG	2.7
1	A	391	ALA	2.7
2	C	280	LEU	2.7
1	A	455	GLN	2.6
2	D	92	CYS	2.6
2	D	93	ALA	2.6
2	C	303	PRO	2.6
1	B	720	SER	2.6
1	B	-14	GLY	2.6
1	A	627	SER	2.6

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Mol	Chain	Res	Type	RSRZ
1	B	624	LYS	2.5
2	C	295	ASP	2.5
1	A	325	ILE	2.5
1	A	216	ALA	2.5
2	D	134	MET	2.5
1	A	326	LYS	2.4
1	A	623	PHE	2.4
1	A	480	LYS	2.4
1	A	367	TYR	2.3
1	A	404	GLY	2.3
1	A	425	GLU	2.3
1	A	436	LEU	2.3
2	C	297	VAL	2.3
1	A	371	LEU	2.2
1	A	624	LYS	2.2
2	C	299	MET	2.2
1	B	382	THR	2.2
2	C	92	CYS	2.2
2	C	393	GLY	2.1
1	B	623	PHE	2.1
2	D	393	GLY	2.1
1	A	384	GLU	2.1
1	A	453	LYS	2.1
1	A	379	GLY	2.1
1	A	573	ASP	2.0
1	A	402	PHE	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [\(i\)](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [\(i\)](#)

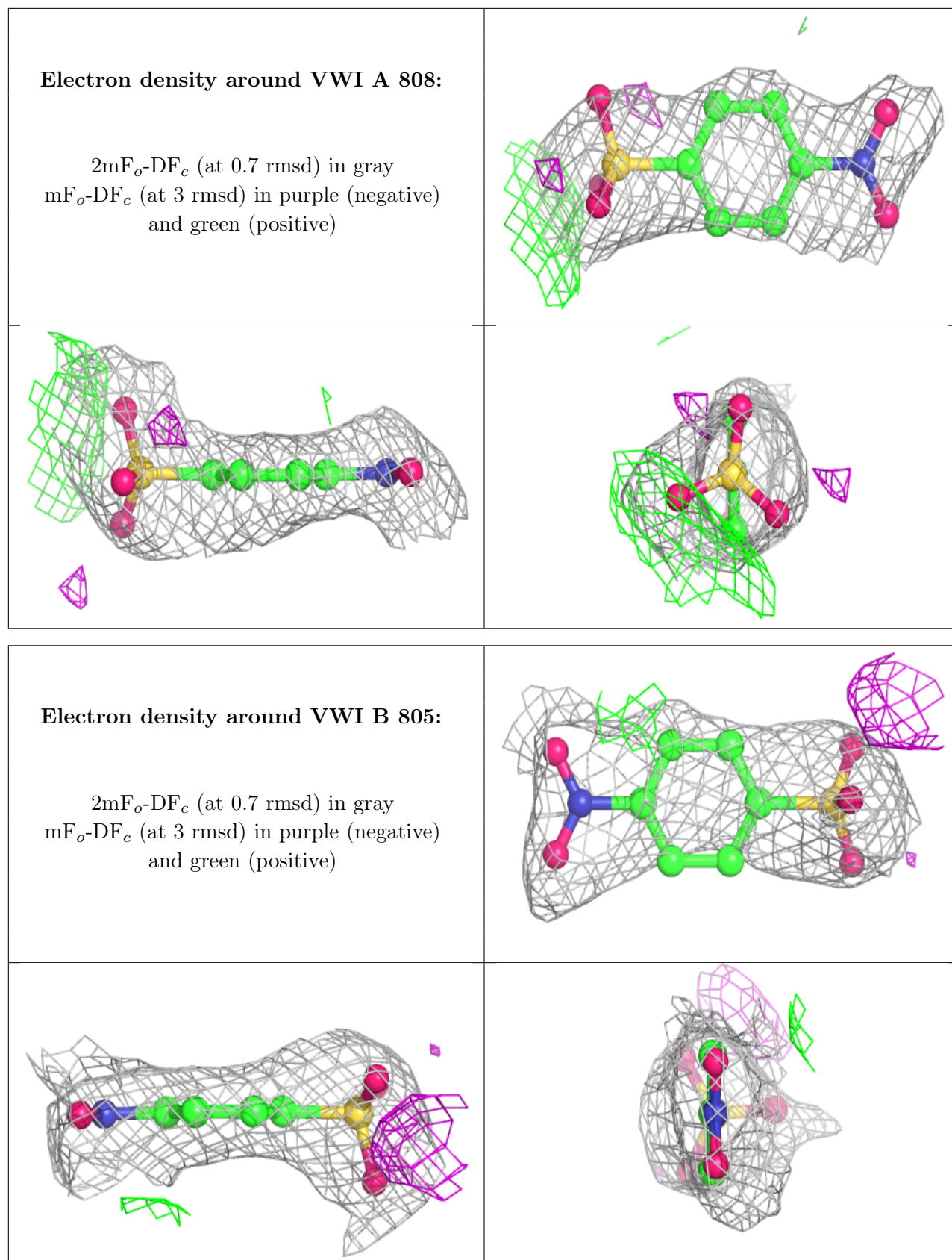
There are no monosaccharides in this entry.

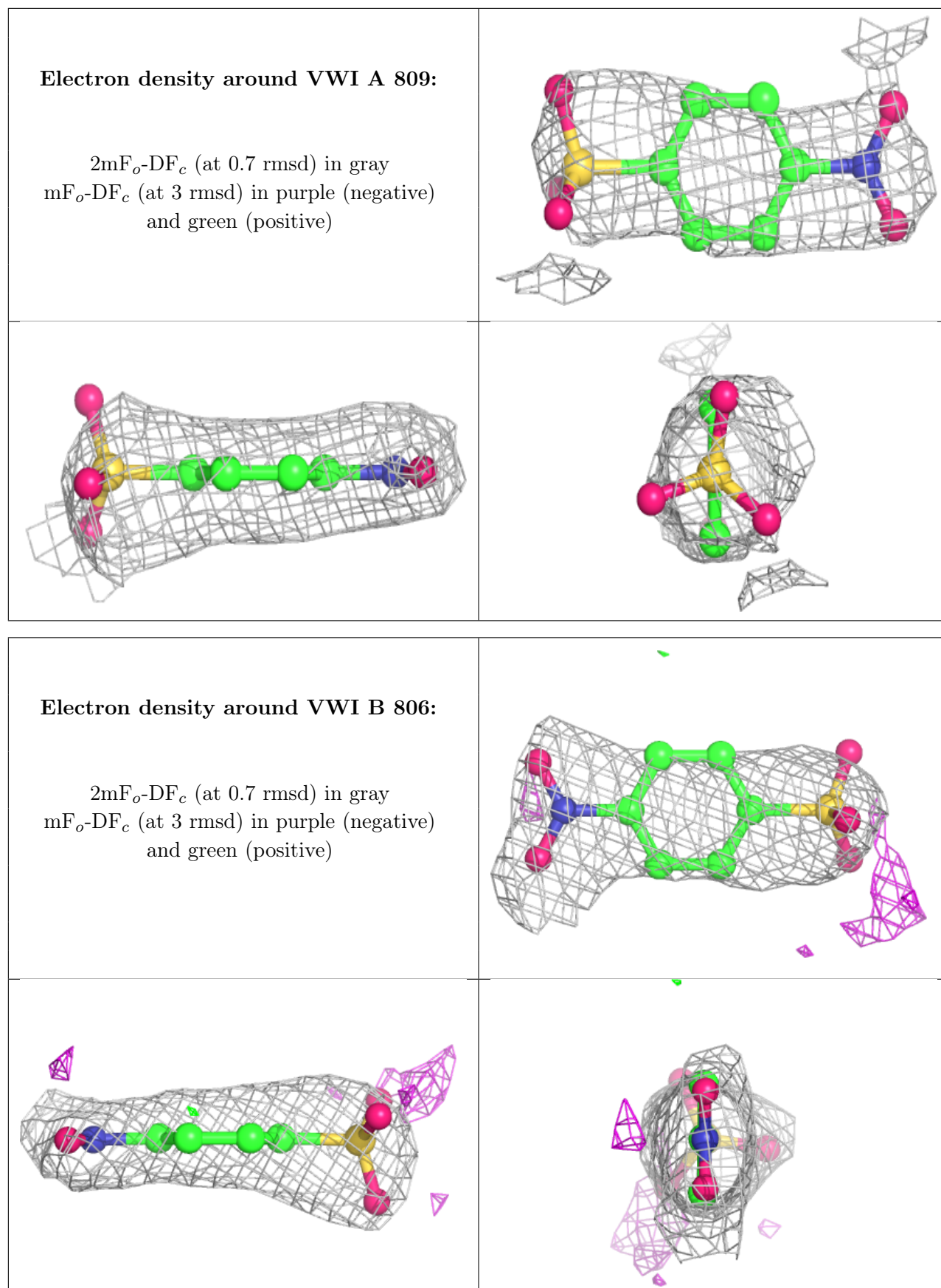
6.4 Ligands [\(i\)](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	SO4	D	504	5/5	0.70	0.31	118,134,148,148	2
5	VWI	A	808	13/13	0.76	0.29	108,119,143,150	0
5	VWI	B	805	13/13	0.79	0.33	95,112,130,134	0
4	SO4	A	803	5/5	0.84	0.30	109,112,118,133	0
5	VWI	A	809	13/13	0.85	0.41	105,118,153,172	0
5	VWI	B	806	13/13	0.86	0.29	105,126,146,160	0
4	SO4	C	505	5/5	0.87	0.20	95,98,112,124	0
4	SO4	B	803	5/5	0.87	0.30	103,106,124,135	0
4	SO4	C	506	5/5	0.88	0.26	104,107,127,143	0
4	SO4	A	802	5/5	0.89	0.17	91,93,118,120	0
5	VWI	A	806	13/13	0.89	0.25	85,101,126,127	0
5	VWI	A	807	13/13	0.91	0.32	90,96,109,120	0
4	SO4	C	504	5/5	0.92	0.17	76,95,118,131	0
4	SO4	D	505	5/5	0.92	0.33	89,98,109,180	0
4	SO4	A	805	5/5	0.92	0.11	117,119,135,137	0
3	GOL	A	801	6/6	0.92	0.21	61,71,80,80	0
5	VWI	B	804	13/13	0.93	0.30	72,92,112,130	0
3	GOL	B	801	6/6	0.93	0.17	56,61,74,74	0
4	SO4	D	502	5/5	0.93	0.23	88,96,119,123	0
4	SO4	D	503	5/5	0.94	0.12	93,97,121,122	0
4	SO4	B	802	5/5	0.94	0.14	93,93,102,107	0
4	SO4	A	804	5/5	0.95	0.12	83,90,108,125	0
4	SO4	C	502	5/5	0.95	0.19	94,104,115,122	0
4	SO4	C	503	5/5	0.96	0.17	75,87,102,108	0
4	SO4	D	501	5/5	0.97	0.17	81,81,97,101	0
4	SO4	C	501	5/5	0.98	0.17	68,72,85,93	0

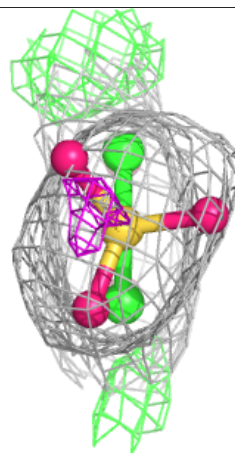
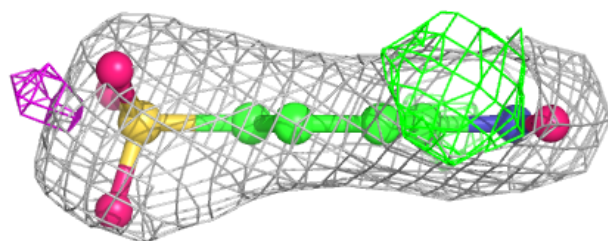
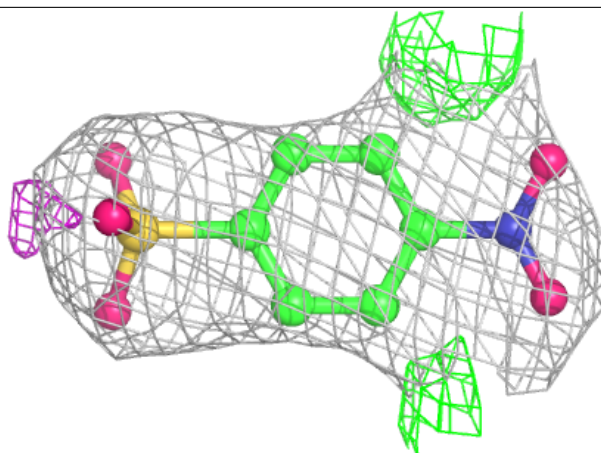
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



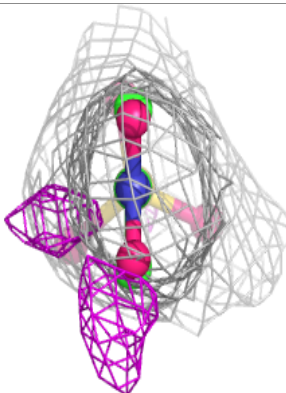
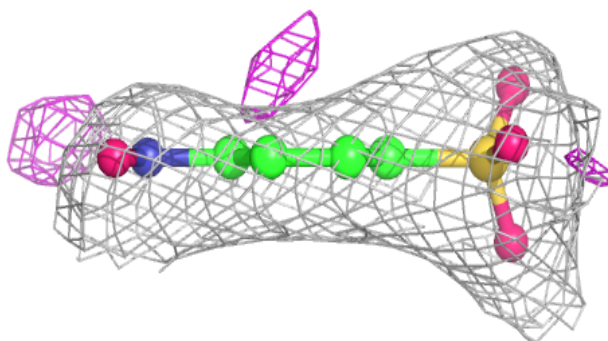
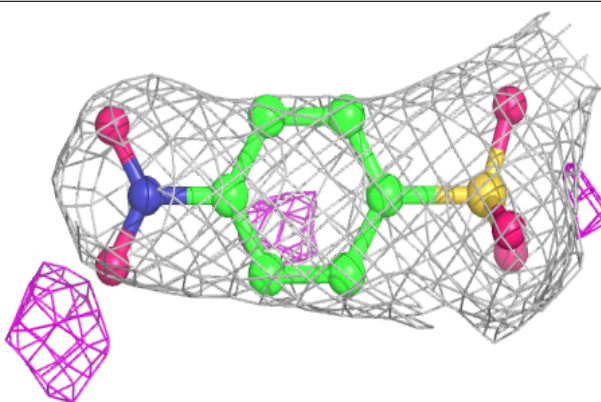


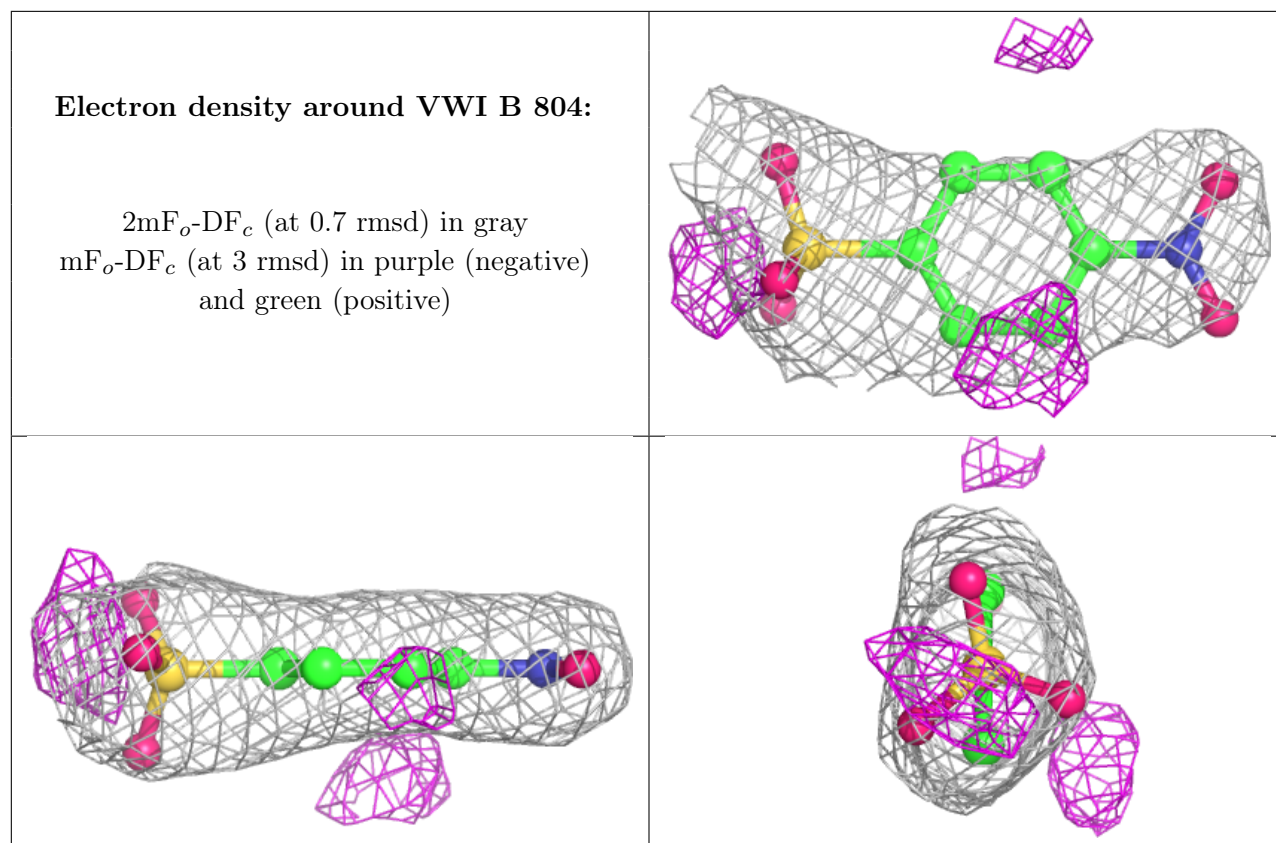
Electron density around VWI A 806:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

**Electron density around VWI A 807:**

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





6.5 Other polymers [i](#)

There are no such residues in this entry.